GILLILAN ASSOCIATES, INC.

Water and Land Conservation and Restoration

Kilpatrick Pond and Dam Restoration Feasibility Study - Supplemental Summary of Final Report

March 27, 2007

Gillilan Associates, Inc. and project partners Applied Geomorphology, Oxbow, Inc. and Hoitsma Ecological were hired by the Idaho chapter of The Nature Conservancy to assess historic and current channel conditions on Silver Creek and the ecological impacts of Kilpatrick Pond and dam, and make recommendations for addressing identified impacts. This document is supplemental to the Final Report and consists of an expanded summary of the study's key findings.

This study was commissioned by TNC based on information indicating that Kilpatrick Pond may be responsible for above normal warming of stream temperatures during summer months. In addition TNC has received feedback from anglers that fishing has become more difficult in Kilpatrick Pond due to decreased water depth from sediment in-filling behind the dam, and the growth of

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aquatic plants during the high summer. Other stakeholders have suggested that the fishery is declining and angling success is diminishing. Our report attempts to address these concerns and provide TNC with a scientifically-based review of current conditions and recommendations for possible action.

In addition to a field investigation the Project Team undertook a comprehensive literature and data review to assess historic conditions, trends and current conditions of Silver Creek on the Nature Conservancy Silver Creek Preserve. This investigation was necessary to place the physical and biological attributes of Kilpatrick Pond in context. Relative to likely historic and pristine conditions we concluded that Silver Creek and at least some reaches of its tributaries are under-potential. Primary concerns include excessive siltation, over-wide channel dimension limiting sediment transport capacity and trout habitat diversity, above normal water temperatures, and below potential riparian condition.

The principal degradation is the historically documented moderate to excessive channel bed siltation correlated to past agricultural land uses and impoundment by the Kilpatrick Dam. Siltation impacts include: reduction in suitable spawning substrate; loss of water column depth cover; perhaps unusual winter turbidity related to aquatic macrophyte senescence and; alteration of physical aquatic macroinvertebrate habitat. The siltation problem is persistent and is compounded by the fact that the majority of the current channel is over-wide which limits the ability of the channel to flush the accumulated sediments downstream. The over-wide channel also results in a lack of bedform and trout habitat diversity. Quantifying the degradation of the habitat in the study area is difficult since there are no accepted standard habitat metrics for large, low-gradient spring creeks which are distinctly different than higher gradient free-stone creeks in the Intermountain West.

Our study also concluded that the Kilpatrick Dam impoundment is also responsible for increasing summer water temperatures beyond background levels. Based on a recent study utilizing aerial infrared photography and analysis of stream temperature data collected by TNC, during the hot summer months the pond reaches a maximum daily stream temperature at least 6 hours before the rest of the stream, thereby affecting both the magnitude and duration of adverse temperatures. Given past examples of downstream fish kills due to high temperature and low dissolved oxygen content, we consider this to be a periodically significant impact. Temperature stratification was documented in the pond in July 2006, with surface temperatures up to three degrees F higher than subsurface temperatures.

While some reaches on Silver Creek on the Preserve host a dense and diverse assemblage of riparian plant communities, other reaches including the Pond reach are under-potential. A riparian study of Silver Creek based on a 1984 aerial photo found that only 26% of the 65 miles of Silver Creek has adequate riparian cover. TNC and other landowners have worked to improve this situation

with active riparian restoration programs. A follow-up riparian study is recommended.

While Silver Creek on the Preserve supports a robust trout fishery, impairments may be holding it below potential. Interestingly, there are historic records dating back to at least 1947 from trained observers and managers that suggest that Silver Creek periodically experiences either declines in the fishery or angling success, or both. Current impairments could also increase the risk of fishery declines when exposed to environmental stressors such as extended drought combined with high maximum summer air temperatures, whirling disease, excessive macrophyte growth, or non-native invasive species such as the New Zealand mudsnail. Further exploration on the role of aquatic macrophytes in both creating and limiting trout habitat is recommended. Historic reports have tied fishery observations to macrophyte levels. This discussion is intrinsically woven into the synergistic relationship between the stream's sediment load, its role in vegetative establishment and sediment transport during full florescence and senescence.

To focus the development of alternatives for mitigating the impact of the pond, the Project Team worked with TNC to develop a "guiding image". We grouped possible images into two categories: true restoration or enhancement. Objectives for both restoration and enhancement activities included: achieving sediment transport continuity, improving habitat connectivity, maximizing riparian potential; reducing thermal impacts of the dam and; improving existing fishing opportunities.

Nine alternatives were initially developed. These alternatives were then subjected to a preliminary constraints and benefits analysis and three preferred alternatives were developed in greater detail along with a cost:benefit analysis. While dam removal is the number one alternative from an ecological restoration perspective, it was not evaluated in detail due to the stated preference of Picabo Livestock to seek solutions that maintained the recreational and aesthetic benefits of the pond. The next highest alternative is the modification of the dam to add a bottom release outlet structure (150 cfs capacity). The benefits of such a structure are cool water release (thermal benefits), hydraulic removal of pond sediments, improved sediment transport, improved angling by pond deepening, the ability to lower the pond elevation to allow additional sediment removal and/or revegetation of exposed sediment. The downstream flushing of sediment would require careful consideration for the fate of the sediment such that downstream impacts are mitigated. This alternative would cost on the order of $300,000. Cost:benefit considered to be good.

The third alternative considered is modification of the dam to lower the outlet elevation but not to the extent that a bottom release structure would allow. Lowering the pond elevation would allow access to impounded sediments for mechanical removal or revegetation. Cost is anticipated to be on the order of

$65,000+. Ecological benefits of this alternative are considered to be limited. Cost:benefit considered neutral to fair.

The fourth alternative is the active/experimental revegetation of pond sediments during the non-irrigation season when pond is at low-pool stage. The cost for this type of effort is anticipated to be on the order of $80,000/acre. The ability for the planted material to self-propagate after planting and expand coverage of the sediments is unknown. For this reason we have recommended that if this alternative is pursued that it be undertaken in a phased manner with observation of planting success and ability to self-propagate between planting years. We consider the ecological benefits of this approach to be neutral to potentially fair. The cost:benefit of this alternative is open to discussion.

Two additional discussions are included in the final report -- one regarding an analysis of channel dimension and sediment transport capacity, and a second discussing the need for a systemic/holistic evaluation of the Silver Creek watershed trout habitat, riparian vegetation, and geomorphology. The sediment transport analysis concluded that the channel width:depth ratio of Silver Creek above and below the pond are not generally conducive to equilibrium sediment transport, with channel widths up to 50% higher than optimum. Once spring creeks become overwide they do not tend to re-establish narrower cross-sections even with changes in land management and therefore when combined with heavy siltation, they tend to remain silted.

The second discussion is an alternative and recommendation that TNC consider conducting a comprehensive aquatic assessment, prioritization and restoration analysis encompassing Silver Creek from the headwater tributaries to Point of Rocks or perhaps further downstream. This is recommended in order to assess ecological health of Silver Creek holistically. While there is a great deal of monitoring and study on the Preserve, for the most part upstream channel conditions remain somewhat unknown or undocumented though these sites have seen numerous restoration efforts, implying degraded conditions. (These efforts, if comprehensive and successful may have already addressed major degradation, but until a formal evaluation is undertaken this remains unknown). Downstream of the Preserve, due to access on Picabo Livestock, Point of Rocks and observation points from the roads it appears that channel degradation by silt, overwide cross-sections and sparse riparian coverage is almost chronic. Importantly, TNC needs to assess upstream and downstream habitat diversity, geomorphology, riparian condition, water quality, etc in order to fully understand and prioritize their management activities. Holistic stream management that aims at maximizing system health and potential recognizes that every stream reach is affected by other reaches, upstream and down. An undertaking as described in the full report would require the cooperation of a number of landowners and stakeholders in addition to significant capital.